Popcorn Density and Specific Heat Capacity

Weight of Kernels: 1,521 g
Volume of Kernels: 52 oz = 1697mL
Density of Kernels: 0.8963 g/mL

Weight of Butter Salt: 68 g
Volume of Butter Salt: 2 oz = 61 mL
Density of Butter Salt: 1.1148 g/mL

Weight of Oil: 424 g
Volume of Oil: 475 mL
Density of Oil: 0.8926 g/mL

Total Weight: 2,013 g
Total Volume: 2,233 mL
Density of Solution: 0.9015 g/mL

%(m/m) of Solution: 3.38% Salt, 21.06% Oil, 75.56% Kernels

%(v/v) of Solution: 2.73% Salt, 21.27% Oil, 76.00% Kernels

$$Q = m * SH * \Delta T$$

$$Q = 7177 \frac{\cancel{watt}}{\cancel{hour}} * \frac{1\ \cancel{hour}}{3600\ \cancel{sec}} * 330\ \cancel{sec} * \frac{1\ Joule}{1\ \cancel{watt}}$$

$$Q = 657.8913\ Joules$$

$$\Delta T = 55.556℃$$

$$m = 2013g$$

$$SH = \frac{Q}{m * \Delta T}$$

$$SH = \frac{657.89213J}{2013g * 55.556℃}$$

$$SH = 0.0058828 \frac{J}{g * ℃}$$

$$SH = 5.8828 \frac{J}{kg * ℃}$$

Popcorn container 565g

Volume of Kernels: 1521g

Weight of Kernels: 52oz → 1697mL volume

Density of Kernels: 0.8963 grams/mL or 0.8963 Kg/L

Weight of Oil: 481g − 57g = 424g

16oz Volume of Oil: 16oz = 475mL

Density of Oil: 0.8926g/mL

Weight of Butter Salt: 70g − 2g = 68g

Volume of Butter Salt: 2 oz → 61mL

Density of Butter Salt: 1.1148 g/mL or 1.1148 Kg/L

Kernels Total Weight: 2156g − 565g = 1591g ± 2g => 1590g ± 1g

+Salt Total Volume: 1647mL + 61mL = 1758mL

Density of Solution: 0.9044 g/mL or 0.9044 Kg/L

95.66% Kernels or 1g Salt : 22.4g Kerne

%(m/m) of Solution: 4.277% Salt $\overline{410}$

Δtime = 5 min

T_i = 284°F, T_f = 380°F Start Popping Δt = °F

maybe use graph at lowest T → Highest TF & ΔT & Δtime?

Uses 7177 watts/hour

$\begin{array}{r} 195.556 \\ -140 \\ \hline \end{array}$ 55.556°C = ΔT

Kernels +salt +oil

total weight: 1590g +

Total volume = 1758mL +

Density of mixture =

ratio of mixture =

$$5.5\cancel{min} \times \frac{60sec}{1\cancel{min}} = 330sec$$

$$\cancel{7177 watts \times \frac{1J/g}{1watt} \times}$$

$$7177 \frac{watt}{\cancel{hr}} \times \frac{\cancel{1hour}}{60\cancel{min}} \times \frac{1min}{60sec} = \frac{7177 watts}{3600 sec} = 1.99361 watts/sec$$

$$\frac{1.99361 watts}{1 \cancel{sec}} \times \frac{330\cancel{sec}}{1} = 657.892 watts\ used = 657.892\ Joules$$

$$q = m \times SH \times \Delta T \rightarrow SH = \frac{q}{m \times \Delta T}$$

$$\frac{J}{g \times °C} \times \frac{1000g}{1kg}$$

$$SH = \frac{657.892\ Joules}{(2013 g) \times 55.556°C} =$$

$$SH = 5.8828 \frac{J}{kg \times °C}$$